APPENDIX

METHOD AND DATABASES USED

Made with China: Global Supply Chains and the Limits of US Decoupling

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A. METHOD FOR CALCULATING KEY VALUE-ADDED TRADE INDICATORS

This analysis uses the OECD Trade in Value Added (TiVA) database (2025 edition, covers 2007-2022) and Asian Development Bank (ADB)'s Multiregional Input-Output (MRIO) Tables (2007-2024) to examine US-China value added trade and the rerouting of trade through third countries. The ADB MRIO provides the underlying input-output tables but does not directly report all of the indicators used in this paper. We therefore construct the key gross-trade and value-added-trade measures from the MRIO tables following standard input-output accounting and drawing on the logic of the TiVA framework. The *Guide to OECD Trade in Value Added (TiVA) Indicators, 2025 edition*[1] is used as a reference for interpreting the TiVA indicators and for guiding the construction of comparable indicators from the ADB MRIO tables. An ADB report is also drawn upon for methodological guidance.[2] Details on the construction of the indicators used in our analysis are provided in this methodology section.

The OECD Trade in Value Added (TiVA) database grew out of efforts to measure trade in a way that reflects global value chains and avoids the double counting inherent in gross trade statistics. TiVA indicators are a regular OECD statistical product, built from OECD Inter-Country Input-Output (ICIO) tables, with expanding coverage and periodic methodological refinements (documented in successive "Guide to OECD TiVA Indicators" editions).

The TiVA database contains much of the information needed to achieve our study objectives, but it has the disadvantage of providing data only through 2022. Given that supply chains take time to adjust, it is likely that significant movements happened after the

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[1] OECD, Directorate for Science, Technology and Innovation. 2025. *The Guide to OECD Trade in Value Added (TiVA) Indicators, 2025 edition*.
https://stats.oecd.org/wbos/fileview2.aspx?IDFile=2143f34e-6feb-41a9-abaf-cb52132608c4

[2] Asian Development Bank. 2021. *Capturing the Digital Economy: A Proposed Measurement Framework and Its Applications*.
https://www.unescap.org/sites/default/d8files/event-documents/ADB%20capturing-digital-economy-measurement-framework.pdf

Biden administration left the US-China trade war tariffs in place and the Covid-19 recovery was well underway. To obtain a more picture of supply readjustments that includes this period, we rely on an alternative data source that extends through 2024, the Asian Development Bank's Multiregional Input-Output (MRIO) tables, for our main analysis.[3]

Structure of the MRIO tables

The ADB MRIO tables follow a standard multi-regional input–output structure. Each row represents the supply of output from a given country-sector, while each column represents the use of output by a given country-sector. The entry corresponding to row i(e.g., PRC sector c13) and column j(e.g., USA sector c14) records the value of intermediate inputs from sector i produced in China used in the production of sector j in the United States. Collectively, these intermediate flows form the matrix Z.

In addition to intermediate use, the MRIO tables include a separate accounting of final demand, consisting of categories allocated to household consumption (F1), NPISH consumption (F2), government consumption (F3), gross fixed capital formation (F4), and changes in inventories (F5). These components together form the final demand matrix Y. For a given country (e.g., the United States), summing across all final demand categories (F1 – F5) yields a final demand vector y, representing that country's total final demand across all sectors.

For each country-sector j, gross output is denoted by x_j. In the ADB MRIO spreadsheet, this is reported in row r69 (TOTAL). Spreadsheet-wise, row r69 is the sum down each sector column, that is, the total inputs used by sector j. By the standard input-output accounting identity, this equals the gross output of sector j. Thus,

$$x_j = \sum_i z_{ij} + \sum_f y_{jf}$$

where z_{ij}donotes intermediate inputs supplied by sector i and used by sector j, while y_{jf}denotes final demand for output of sector j in final demand category f. Stacking all x_j gives the gross output vector x.

[3] A description of the Multiregional Input-Output Tables can be found on the ADB website: https://www.adb.org/what-we-do/data/regional-input-output-tables?utm_source=copilot.com. The MRIO tables are optimized for deep coverage of the Asia-Pacific region, while TiVA prioritizes cross-country consistency and global balancing. These differences compelled the examination of trends in all our main indicators using both databases. Comparing value-added trade using both series, we find qualitatively similar trends.

Value added for sector j, denoted by VA_j, is reported in row r64.[4] The value-added coefficient is defined as

$$v_j = \frac{VA_j}{x_j}$$

which measures the share of one unit of gross output attributable to domestic value added rather than intermediate inputs.

The technical coefficient, a_{ij}, measures the amount of input from sector i required to produce one unit of gross output in sector j. This is defined as

$$a_{ij} = \frac{z_{ij}}{x_j}$$

Stacking these coefficients gives the global input-output coefficient matrix A. Stating z_{ij} in terms of a_{ij},

$$x_j = \sum_i a_{ij} x_j + \sum_f y_{jf},$$

Or in matrix form:

$$x = Ax + y \rightarrow (I - A)x = y$$

Therefore,

$$x = (I - A)^{-1} y$$

The $(I - A)^{-1}$, denoted by L, is the Leontief inverse, or "output multipliers".[5] It captures the total gross output required across all country-sectors for one unit increase of final demand. Because the MRIO framework explicitly links sectors across economies, the Leontief inverse reflects both domestic and foreign production linkages embedded in global supply chains. Given y is the observed final demand vector in the input-output table, then $x = Ly$ reproduces the observed gross output vector. More generally, for any demand vector d, the induced gross output required to satisfy that demand is

$$q(d) = Ld$$

[4] Row r64 reports value added at basic prices. We use this reported value-added row, rather than a residual calculated as gross output minus total intermediate inputs, because the latter may absorb MRIO valuation-adjustment items such as product taxes less subsidies, international transport margins, and direct purchases abroad by residents. These items affect purchaser prices and table balancing, but are not part of the domestic value added measured in row r64.

[5] Asian Development Bank. 2021. *Capturing the Digital Economy: A Proposed Measurement Framework and Its Applications*, pp.119 – 120.

It is useful to distinguish this induced output vector $q(d)$ from the observed gross output vector x reported in row r69. The former is demand-specific; the latter is the actual total output observed in the MRIO table. This relationship provides the basis for constructing indicators such as the foreign value-added content embodied in US imports.

Construction of Key Indicators

1. China's gross (bilateral) exports to the United States

China's bilateral exports to the United States are constructed as the sum of all flows from Chinese sectors to the US for intermediate use and for final demand. This measure includes both Chinese intermediate exports used in US production and Chinese goods and services absorbed in US final demand,

$$e_{China \to US} = \sum_{i \in China}^{j \in U.S.} z_{ij} + \sum_{i \in China}^{f \in U.S.} y_{if}$$

where the first term captures Chinese intermediate exports used by US industries and the second term captures Chinese exports absorbed in US final demand.

2. China's value added embodied in total US imports

Let $m_{U.S.}$ denote the vector of US imports from all foreign suppliers, including both intermediate and final-use imports, with US domestic supply excluded.

$$m_{U.S.} = \sum_{j \in U.S. sectors} z_{ij} + \sum_{f \in U.S. final\ demand} y_{if}\ , i \in foreign$$

The total gross output worldwide required to satisfy US imports is

$$q(m_{U.S.}) = L\, m_{U.S.}$$

Multiplying by value-added coefficients gives the value added generated worldwide to satisfy that import demand:

$$diag(v) \cdot L\, m_{U.S.}$$

China's value added embodied in total US imports is then

$$\text{VA\_CHN\_in\_US\_imports} = \sum_{j \in China} (diag(v) \cdot L\, m_{U.S.})_j$$

This indicator measures the amount of Chinese value added that reaches the United States, regardless of whether it arrives through China's bilateral exports or through third-country exports.

3. China's value added embodied in China's bilateral exports to the US

Let $e_{China \to U.S.}$ denote China's bilateral exports to the United States, including both intermediate and final-use flows. China's value added embodied in these bilateral exports is

$$\text{VA\_CHN\_in\_bilateral\_exports\_to\_US} = \sum_{j \in China} (diag(v) \cdot L\, e_{China \to U.S.})_j$$

This captures the Chinese domestic value added embodied specifically in China's bilateral export flows to the US

4. China's value added in indirect exports to the US

China's indirect exports to the United States are defined as the difference between China's value added embodied in total US imports and China's value added embodied in China's bilateral exports to the United States:

Indirect_CHN_to_US = VA_CHN_in_US_imports - VA_CHN_in_bilateral_exports_to_US

This residual captures Chinese value added that reaches the United States indirectly through third countries, such as Chinese inputs that are embodied in the exports of third economies such as Mexico, Vietnam to the US

5. China's share of total value added in US imports

$$\text{Total\_VA\_in\_US\_imports} = \sum_{j \in all} (diag(v) \cdot L\, m_{U.S.})_j$$

VA_CHN_share_in_US_VA_imports = VA_CHN_in_US_imports / Total_VA _in_US_imports

6. China's value added as share of Mexico's exports in sector p to the US

Mexico's exports in sector p to the US:

$$e_{Mexico(p) \to US} = \sum_{j \in U.S.} z_{pj} + \sum_{f \in U.S.} y_{pf}$$

China's VA contents in Mexico's sector p exports:

$$\text{VA\_CHN\_in\_MEX\_exports(p)} = e_{Mexico(p) \to US} * \sum_{k \in China} v_k L_{kp}$$

China's VA share in Mexico's sector p exports to US:

$$\text{VA\_Share\_CHN\_in\_MEX\_exports(p)} = \frac{e_{Mexico(p) \to US} * \sum_{k \in China} v_k L_{kp}}{e_{Mexico(p) \to US}} = \sum_{k \in China} v_k L_{kp}$$

The Chinese value added as share of Vietnam's exports in sector p to the US indicator is constructed under the same methodology.

B. DESCRIPTION OF DATABASES USED IN VALUE-ADDED CALCULATIONS

A. OECD TiVA Database

The TiVA indicators used here are from the 2025 edition, January 2026 revision, and are reported either in current-price US dollars or as percentages. The database covers 80 economies, 17 regional aggregates, and 50 ISIC Rev. 4 sectors. TiVA indicators are constructed using OECD's extended Inter-Country Input-Output (ICIO) tables, which distinguish processing and non-processing trade for China and Mexico, but the published TiVA indicators currently extend only through 2022.

To extend the comparison through 2024, we use OECD's newly released projected 2023 and 2024 ICIO tables,[6] together with the 2016-2022 regular ICIO tables, to compute China's share of total value added in US imports using the same methodology described in Appendix 1. Although the projected tables do not split China and Mexico into processing and non-processing segments, they provide a useful robustness check for our key result. The ICIO-based calculation shows that China's share of total value added in US imports fell by about 2 percentage points from 2017 to 2024, matching the result obtained from ADB's MRIO tables.

OECD builds the ICIO tables using a mix of National Accounts and reconciles bilateral trade flows using UN Comtrade and other sources. The detailed procedure can be found in OECD's ICIO Database Development.

The TiVA database comprises 6 sets of indicators. In the analysis, we used gross exports and the origin of value-added content in gross imports.

The gross exports are total value of goods and services exported from the exporting country, adjusted for re-exports. In this analysis we use this indicator as Vietnam, Asean and Mexico's gross exports to the US, as shown in figure 8 and 9, as well as the denominator for the Chinese value-added share in Vietnam and Mexico's sectoral exports to the US This indicator is extracted from the ICIO/MRIO system, it is not expected to match official US trade statistics exactly, but is conceptually comparable because both refer to the bilateral flow.

The origin of value-added content in gross imports includes four dimensions: value-added source country, exporting country, exporting industry, importing country. This indicator is

[6] OECD's PYP ICIO tables are available in both current prices and previous year's prices; we use the current-price tables. The dataset is available at OECD Global Value Chain data across trade, multinationals and services.

used to calculate Chinese value-added contents in ASEAN countries' exports to the US, and in Vietnam and Mexico's exports to the US

The ICIO system is adapted from the OECD STAN Database, or the OECD Annual National Accounts for OECD countries; for non-OECD countries, sources include United Nations Statistics Division (UNSD) and Eurostat databases as well as National Accounts statistics published by national statistical institutes.[7] See OECD's TiVA overview and methodology pages: Measuring trade in value added.

B. ADB MRIO Tables

The ADB MRIO tables are expressed in millions of US dollars at current prices. The database building on the World Input-Output Database (Timmer et al. 2015) covers economies in Asia and the Pacific and is available in versions with 62 economies and 72 economies, together with an aggregated Rest of the World. Compared with the OECD TiVA database, the ADB MRIO has a more aggregated industry classification, with 35 sectors in total. The sectors are based on ISIC revision 3.1. To maintain consistency over time, this analysis uses the 62-economy version of the ADB MRIO for 2007 - 2024.

Although both OECD ICIO and ADB MRIO are grounded in national accounts, they are constructed from different combinations of source tables, trade-balancing techniques, sector mappings, economy coverage, and other necessary balancing procedures.[8] Numerical differences in value-added indicators are therefore expected even for the same year. These differences do not alter the substantive conclusions of the analysis: comparisons using OECD TiVA indicators show patterns consistent with those derived from the ADB MRIO. In particular, the TiVA-based series reproduce the same broad trends in China's value-added exports to the United States relative to its gross exports, the share of China's value added in total US imports through both direct and indirect channels, the value-added and gross exports of Vietnam and ASEAN to the United States, and China's value added embodied in Vietnam's and Mexico's exports to the United States.

The ADB MRIO is an input-output accounting system rather than a customs trade dataset, so the bilateral gross trade flows derived from it should be interpreted as MRIO-consistent estimates rather than bilateral trade statistics reported by US Bureau of Economic Analysis.

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[7] OECD, Directorate for Science, Technology and Innovation. 2025. *The Guide to OECD Trade in Value Added (TiVA) Indicators, 2025 edition,* p. 13.

[8] Yamano, Norihiko et al. 2023. "Development of the OECD Inter Country Input-Output Database 2023", *OECD Science, Technology and Industry Working Papers*, No. 2023/08, OECD Publishing, Paris, https://doi.org/10.1787/5a5d0665-en.

At the same time, input-output accounting makes it possible to distinguish gross exports from value-added exports. ADB's reports always follow the decomposition framework by Wang, Wei, and Zhu (2013),[9] under which gross exports can be decomposed into domestic value added (DVA), foreign value added (FVA), and pure double-counted terms (PDC), such that:

$$\text{Gross exports} = \text{DVA} + \text{FVA} + \text{PDC}^{10}$$

ADB MRIO is among the most up-to-date ICIO systems currently available. ICIOs have limitations. Its accuracy depends on the quality of the underlying national statistics, which raises issues of cross-country comparability.[11] Indicators derived from the ICIO system, including bilateral gross trade flows, should not be interpreted as equivalent to customs-recorded trade statistics. That said, the main value of ICIO tables is that they make it possible to measure different forms of value-added trade and thereby reveal supply-chain linkages that are not visible in conventional customs trade statistics.

[9] Asian Development Bank. 2022. *Asian Economic Integration Report 2022: Advancing Digital Services Trade in Asia and the Pacific*.
https://www.adb.org/sites/default/files/publication/770436/asian-economic-integration-report-2022.pdf
[10] Wang, Zhi, Shang-Jin Wei, and Kunfu Zhu. 2013. *Quantifying International Production Sharing at the Bilateral and Sector Levels*. NBER Working Paper 19677.
https://www.nber.org/system/files/working_papers/w19677/w19677.pdf
[11] Asian Development Bank. 2021. *Key Indicators For Asia and the Pacific,* p.249.
https://www.adb.org/sites/default/files/publication/720461/ki2021.pdf